AUTO REFKERATOMETER

ACCUREF-K 9001

Operations Manual

SHIN-NIPPON

RB-400-B02Q

INTRODUCTION

This manual contains information on correct handling and operational procedures as well as safety consideration pertinent to ACCUREF-K 9001.
Before carrying out measurement and/or adjustment, read the instructions thoroughly so that effective operation is ensured. As this constitutes an important reference and user guide, keep it on hand at all times.

NOTE

- The information contained in this manual is subject to change without notice.
- While reasonable efforts have been made in the preparation of this document to ensure its accuracy, you should contact your local distributor immediately, if any quarries arise due to editorial errors or omissions etc.
- If you find any imperfect collating or missing pages, contact your local distributor for replacement.

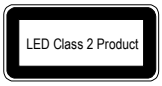
SAFETY CONSIDERATION

ACCUREF-K 9001 is a Class I, Type B medical instrument as well as LED Class 2 product.
This instrument complies with Medical Device Directive 93/42/EEC.

A great deal of consideration has gone into the design and manufacturing of this instrument with regard to its operational ease, the patient's safety and well-being as well as to the reliability of the product.
For safer and more effective use, however, follow the points described in this manual.

This instrument is designed for professional use.

~ General Definitions of Safety Symbols ~

	Personal injury or physical damage may occur when this warning is ignored. General warning. Caution. Risk of danger.
	Denotes general ban or prohibition.
	General mandatory action.
	Caution of invisible LED radiation. Avoid exposure to beam. Indicated inside of the device.
	This device is an LED class 2 product.
	Additional information which is important to the text or is useful/convenient to know.
	Symbol for “MANUFACTURER”.
	Symbol for “AUTHORISED REPRESENTATIVE IN THE EUROPEAN COMMUNITY”.

CAUTION

- Always take great care when operating ACCUREF-K. Malfunction or damage to the instrument could occur.
- Cut the power immediately if malfunction occurs during operation. Damage to the equipment or personal injury will result. Consult your dealer, if repair work needs to be carried out.

- At no time attempt to remodel or disassemble ACCUREF-K. Damage to the instrument or personal injury will result.
- As ACCUREF-K is a precision optical instrument, operations must be carried out at all times by experienced, authorized personnel. Damage to the equipment or personal injury will result.
- Electromagnetic wave generated by TV, radio, mobile phone, radio transceiver, etc. may cause malfunction of this instrument. This instrument may also generate noise in the TV, radio, mobile phone, radio transceiver, etc.
  Avoid introducing or installing instruments which may have adverse influence to the circumstance.
- Avoid use this instrument adjacent to other instruments or stacked in plies. Failure or malfunction of the instrument may occur.
- Avoid installation near TV or radio. The reception can be disturbed by electrical noise. Follow the manual for the proper installation.
- Never remove the plug from the outlet if your hands are wet. Electric shock or personal injury could result.
- Make sure the power cord is not damaged. Fire or electric shock may occur.
- Do not touch the optical parts. Measurement accuracy will be adversely affected.

- The power cord must be firmly connected to an electrical ground (safety ground) at the power outlet. Personal injury may result from electric shock, etc.
- If the instrument fails to work properly, you should not try to repair the fault. Consult your dealer immediately.
- The instruction in this manual ensures correct operations.
- Observe the following environmental conditions for used and storage. Avoid dew condensation at all time.

	Temperature	Relative humidity
Use	+10°C to +40°C	30% to 85%
Storage	–10°C to +60°C	below 70%

Avoid the following conditions for storage and use of the instrument.

- Where noxious gases or air pollutants are present.
- Where dust and grit may occur.
- Where oil fumes or greasy substances are emitted.
- Where there are atmospheric concentrations of salt.
- Near gas generation areas and places where dust accumulates.
- Keep in a secure, stable situation. Do not expose to strong vibrations (areas of seismic activity) and sudden shocks (this includes transportation) etc.
- Where there is an inclination of more than 10 degrees.
- Where voltage from the power sources rises or falls sharply during loading.
- Where fluctuations in the voltage of the power source occurs.
- Direct contact with sunlight.

If the instructions above are not followed, damage to the equipment or personal injury will ensue.

Guidance and manufacturer's declaration – electromagnetic emissions		
ACCUREF-K9001 is intended for use in the electromagnetic environment specified below. The customer or the user of ACCUREF-K9001 should assure that it is used in such an environment.		
Emissions test	Compliance	Electromagnetic environment – guidance
RF emissions CISPR 11	Group 1	ACCUREF-K9001 uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	ACCUREF-K9001 is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

Guidance and manufacturer's declaration – electromagnetic immunity			
ACCUREF-K9001 Image Intensifier is intended for use in the electromagnetic environment specified below. The customer or the user of ACCUREF-K9001 Image Intensifier should assure that it is used in such an environment.			
Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment – guidance
Electrostatic discharge (ESD) IEC 61000-4-2	± 6 kV contact ± 8 kV air	± 6 kV contact ± 8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %.
Electrical fast transient/burst IEC 61000-4-4	± 2 kV for power supply lines ± 1 kV for input/output lines	± 2 kV for power supply lines ± 1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	± 1 kV differential mode ± 2 kV common mode	± 1 kV differential mode ± 2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5 % U_T (>95 % dip in U_T) for 0.5 cycle 40 % U_T (60 % dip in U_T) for 5 cycles 70 % U_T (30 % dip in U_T) for 25 cycles <5 % U_T (>95 % dip in U_T) for 5 s	<5 % U_T (>95 % dip in U_T) for 0.5 cycle 40 % U_T (60 % dip in U_T) for 5 cycles 70 % U_T (30 % dip in U_T) for 25 cycles <5 % U_T (>95 % dip in U_T) for 5 s	Mains power quality should be that of a typical commercial or hospital environment. If the user of ACCUREF-K9001 Image Intensifier requires continued operation during power mains interruptions, it is recommended that ACCUREF-K9001 Image Intensifier be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE U_T is the a.c. mains voltage prior to application of the test level.			

<table>
<tr><th colspan="4">Guidance and manufacturer’s declaration – electromagnetic immunity</th></tr>
<tr><td colspan="4">ACCUREF-K9001 is intended for use in the electromagnetic environment specified below. The customer or the user of ACCUREF-K9001 should assure that it is used in such an environment.</td></tr>
<tr><td>Immunity test</td><td>IEC 60601
test level</td><td>Compliance
level</td><td>Electromagnetic environment – guidance</td></tr>
<tr><td>Conducted RF
IEC 61000-4-6</td><td>3 Vrms
150 kHz to 80 MHz</td><td>3 Vrms</td><td>Portable and mobile RF communications equipment should be used no closer to any part of ACCUREF-K9001, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.

Recommended separation distance
$d = 1.2\sqrt{P}$</td></tr>
<tr><td>Radiated RF
IEC 61000-4-3</td><td>3 V/m
80 MHz to 2.5 GHz</td><td>3 V/m</td><td>$d = 1.2\sqrt{P}$ 80 MHz to 800 MHz

$d = 2.3\sqrt{P}$ 800 MHz to 2.5 GHz

where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m).

Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, [a] should be less than the compliance level in each frequency range. [b]

Interference may occur in the vicinity of equipment marked with the following symbol:
 </td></tr>
<tr><td colspan="4">NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.</td></tr>
<tr><td colspan="4">[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which ACCUREF-K9001 is used exceeds the applicable RF compliance level above, ACCUREF-K9001 should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating ACCUREF-K9001.

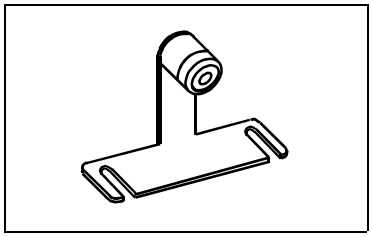
[b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.</td></tr>
</table>

Recommended distance between portable/mobile RF communication equipment and ACCUREF-K9001			
ACCUREF-K9001 intends to be used in the radiated RF contolled environment. Customers or users of ACCUREF-K9001 shall maintain the minimum safe distance between portable/mobile RF communication equipment(transmitter) and ACCUREF-K9001 to prevent electromagnetic interference. The minimum distance shall be accordance with the maximum output of the communication equipment as recommended below.			
Rated maximum output power of transmitter W	Separation distance according to frequency of transmitter m		
	150kHz to 80MHz $d = 1.2\sqrt{P}$	80MHz to 800MHz $d = 1.2\sqrt{P}$	800MHz to 2.5GHz $d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23
For transmitters rated at a maximum output power not listed above, the recommended separation distance d in metres (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer. NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies. NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			

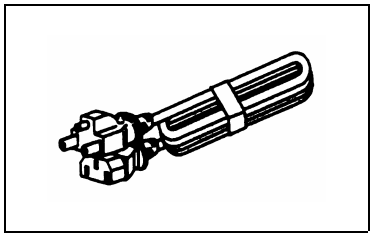
CONTENTS

Introduction **1**
Safety Consideration **1**
Accessories **7**
1. Parts Identification **8**
2. Conveyance and Handling Procedure **9**
3. Installation Environment **9**
4. Safeguard Summary **10**
5. Preparation **11**
5.1 Setting 11
5.2 Applying Power 12
5.3 Standby 13
5.4 Switch Function 14
6. Measurement **15**
6.1 Measurement Flow 15
6.2 Alignment 16
6.3 Measurement Results 17
6.4 Print Out 18
6.5 Kerato-Peripheral Measurement 19
6.6 IOL Measurement Function 21
6.7 Menu Screen Setting 22
6.7.1 Each Item Description 23
6.7.2 Optional Functions 26
6.8 Auto Start Function 30
6.9 Data Screen Function 31
6.10 Power Saving Function 32
6.11 Output Terminal 32
7. Tips for Effective Measurement **33**
8. Error Messages **34**
9. Troubleshooting **35**
10. Contact Lens: Base Curve Measurement **36**
11. Storage and Maintenance **37**
11.1 Reloading Printer Paper 37
11.2 Fuse Replacement 38
11.3 Storage 38
11.4 Confirmation of Measurement Accuracy 39
11.5 Periodical Inspection and Maintenance 39
12. Specification **40**

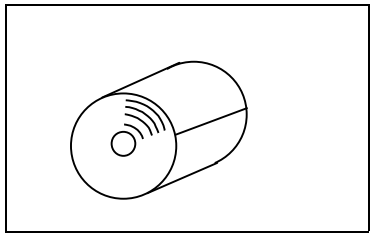
Accessories



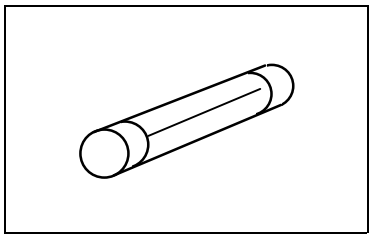
Model Eye: 1
(with a contact lens holder
A sticker indicating the
diopter value is affixed.)



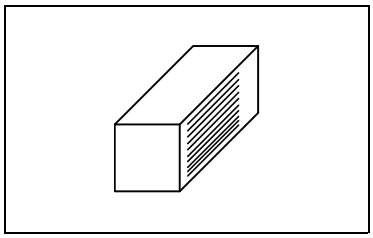
Power Cord: 1
(2.5m)



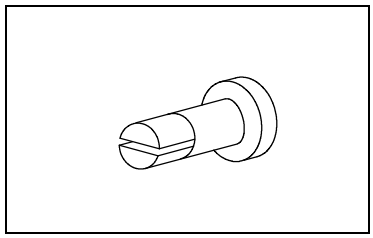
Printer Paper: 3
(width 57mm)
(Two packed and one installed
into the body)



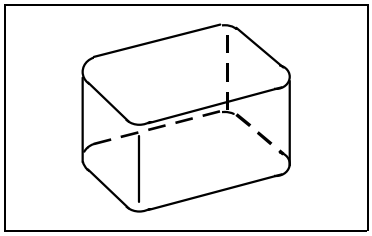
Fuse: 2
(T2A 250V)



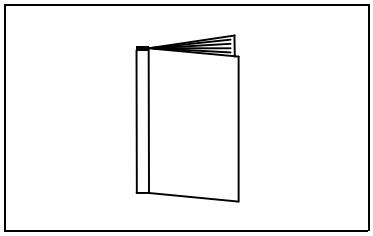
Pack of Chin Rest Liners: 1
(1,000 sheets)



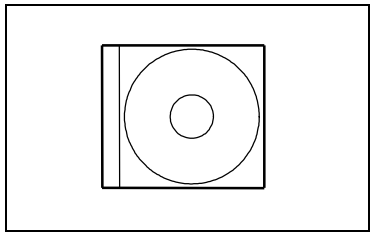
Chin Rest Liner Pin: 2



Dustproof Cover: 1



Operations Manual: 1



Filing Soft: 1

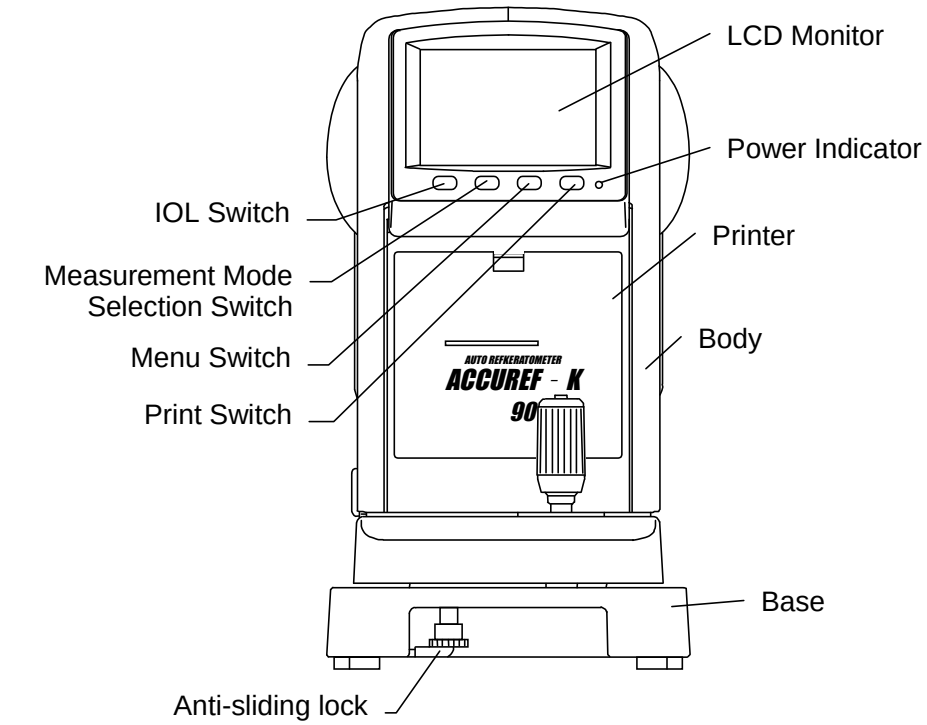
Cable to be used

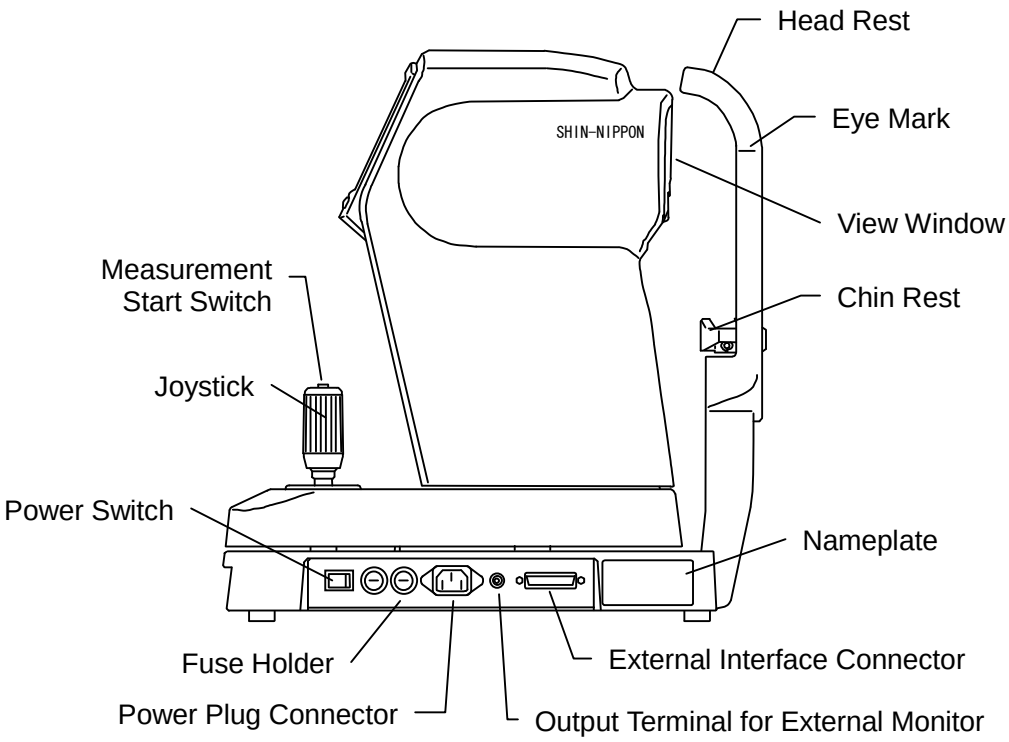
Name	Model No.	Length
Power cord	KP4819YKS31A	2.5m

- Use accessories specified by us to avoid any malfunction or failure.
- Use of accessory (power cord) other than specified below may adversely affect other instruments and/or cause malfunction of the instrument. Always use the accessory specified by us.

- Extra care should be taken for storage of a model eye. Avoid where the lens of the model eye may be damaged as well as any dusty or humid/steamy environments.
- Avoid direct sunlight, humidity and high temperature when storing printer paper which is a thermal paper.

1. Parts Identification



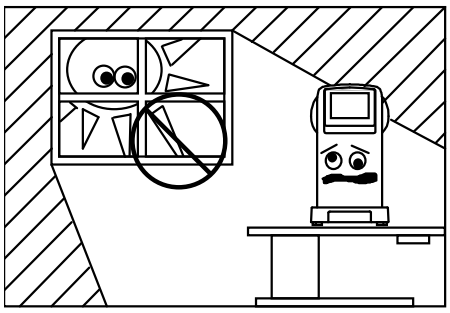


2. Conveyance and Handling Procedure

When transporting the instrument, make sure that the body has been securely locked.
Center the body onto the base so that their edges are aligned. Push up the lock while turning right until both body and base are firmly fixed to each other.

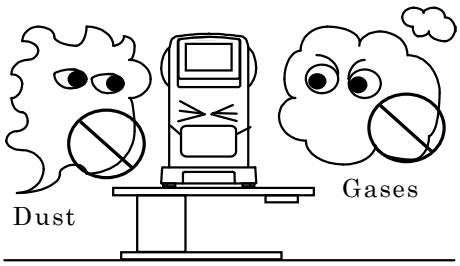
3. Installation Environment

1) Do not expose the instrument's view window directly to the sunlight or bright lighting from other sources.



> Great care should be taken and avoid that the examinee is exposed to strong light or glare. The pupil will contract too much for measurement to be carried out.

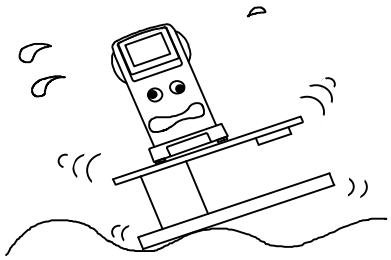
2) Do not operate in places where either dust or rubbish accumulates. Environment with extremes in heat and humidity should also be avoided.
Always follow the environmental requirements below for installation.



Temperature	+10 °C ~ + 40°C
Relative Humidity	30 % ~ 85 %

3) Keep away from inflammable or explosive gases as well as storage areas housing medical supplies and chemicals.

4) Avoid installing where dew condensation may accumulate. Also, avoid where the radical temperature changes may occur.



5) Keep away from sites that may experience strong vibrations or sudden shocks.

6) Malfunction is likely to occur if the instrument is improperly stabilized or accidentally overturns.
To prevent internal/external damage caused by sudden impact, set the instrument on a solid and secure surface. Do not store in high, 'out of reach' places.

4. Safeguard Summary

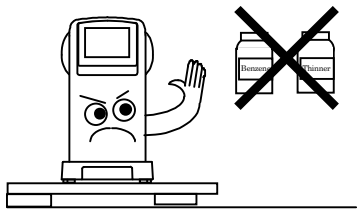
1. ACCUREF-K is a precision optical instrument. Always handle with care and avoid dropping it accidentally.

2. Ensure that the instrument is properly grounded when connected to the power source.

3. Do not touch the optical parts with fingers and be sure to avoid dust, as their measuring accuracy could be adversely affected and incorrect values may result.

> When dust or fingerprints appear on the optical part, use a soft cloth to wipe off the build-up. In case that the build-up is hard to remove, absolute alcohol is recommended. Take great care when cleaning these parts as they are particularly sensitive and fragile.

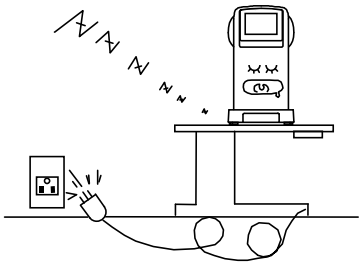
4. If the surfaces of the measuring unit and main unit including the control panel are dirty, gently wipe with a dry cloth. For hard to remove stains, a damp cloth or neutral cleanser is recommended.



> Avoid using organic solvents that will damage the water based paint finish of the instrument.

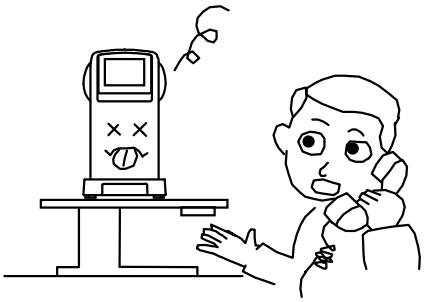
5. Clean the chin rest and head rest with the neutral cleanser. For disinfecting them, especially where the examinee may contact, hydrogen peroxide (Oxydol) is recommended.

6. If the instrument is not used for any length of time, remove the power cord from the outlet.



7. When not in use, protect the instrument with a supplied dustproof cover.

8. When the instrument fails to function properly, **never attempt to perform internal service or adjustment.** Contact your nearest registered agent, distributor or retail outlet.

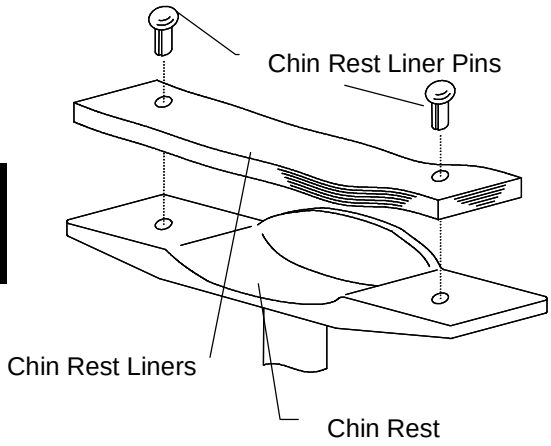


5. Preparation

5.1 Setting

(1) Set a roll of printer paper in the printer. Refer to '11.1 Reloading Printer Paper' for the procedure.

(2) Set and fix the chin rest liners with the chin rest liner pins on the chin rest. Refer to the figure on the right.

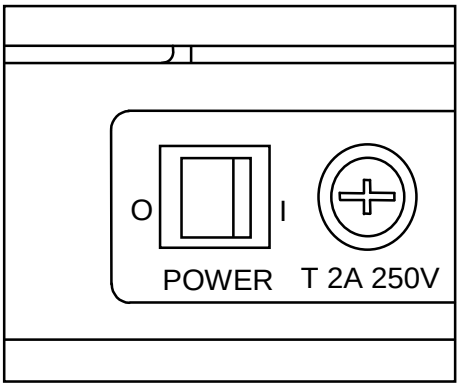


NOTE

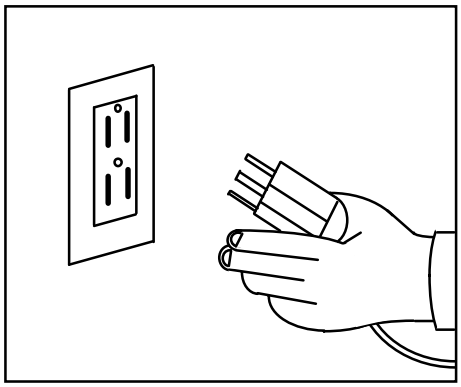
For sanitary consideration, disposing a sheet of the used chin rest liners after every measurement is recommended.

- Always use the chin rest liners following above.
- For sanitary consideration, disinfecting the chin rest with Oxydol is recommended.

5.2 Applying Power

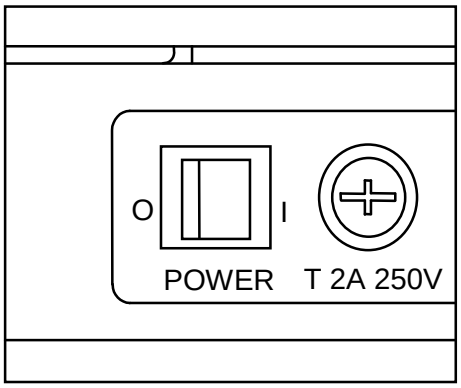


(1) Confirm that the power is 'OFF' （○）.



(2) Insert the power cord into the instrument's power plug connector. Then insert the plug into a general purpose outlet.

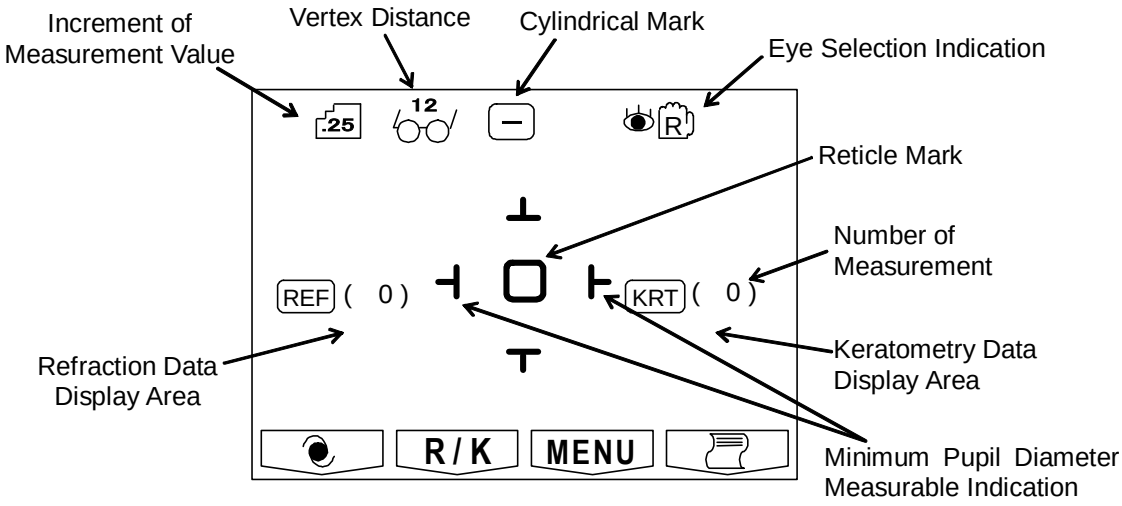
> Always make sure that the cable is grounded.



(3) Turn the power switch 'ON'（｜）.

5.3 Standby

When the power is turned on, the screen as shown below appears on the LCD monitor, which is ready for take measurements.

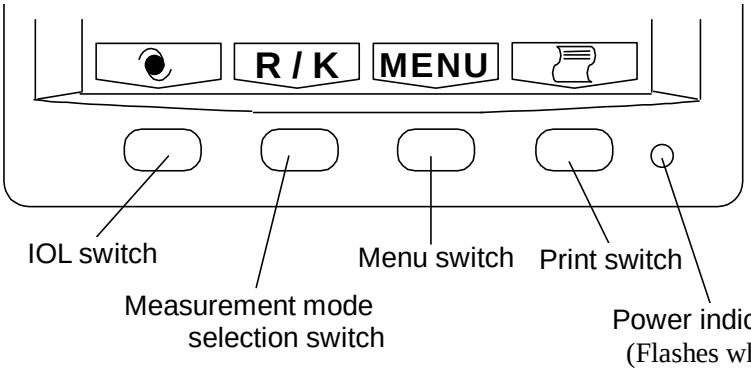


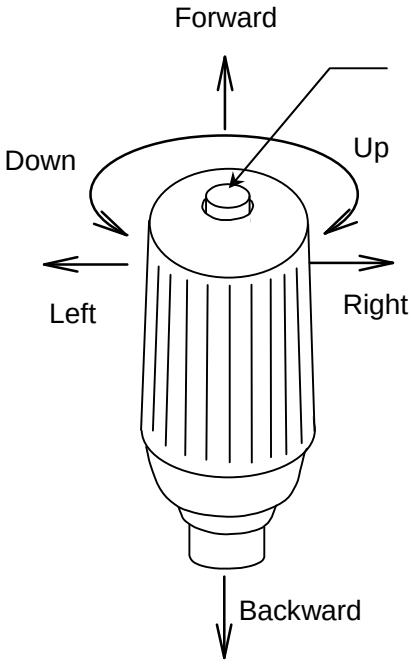
Icon Description (Normal Measurement)

Icon	Description
.25	Increment of refraction data
12	Indication of corneal vertex distance Options are 0, 10, 12, 13.5 and 15mm.
−	Mark of cylindrical value
R	Indicates an eye to be measured.
REF	Refractive data display area. Values of S, C and A are indicated.
KRT	Keratometry data display area. Indicates values of R1, R2, A. It is also available to indicate the results as K1, K2, and KC, setting in the mode selection screen.
	IOL measurement mode indication
R/K	Selects measurement mode: refraction & keratometry continuous measurement (R/K mode), refractive measurement (R mode), keratometry measurement (K mode), and kerato-peripheral measurement (P.K. mode).
MENU	Switches over to Menu screen.
	Displays the measurement result on the screen and prints it out.

5.4 Switch Function

Operating switches under a LCD monitor corresponds to the icons displayed on the bottom of the screen. For normal measurement, each switch functions as below.





Measurement Start Switch: starts the measurement

Operation of Joystick

- Forward: moves the measuring unit toward an examinee.
- Backward: moves the measuring unit toward an examiner.
- Right/Left: moves the measuring unit to the right or left respectively.
- Moves the measuring unit up when rotated to the right and down when to the left.

6. Measurement

6.1 Measurement Flow

(1) Rotate an anti-sliding lock clockwise to release it.

(2) Have the examinee place his/her chin on the chin rest and his/her forehead against the head rest. Then, have him/her see a target.

> NOTE Uncomfortable posture may cause fatigue to the examinee during measurement. Vertically adjust the optical table or the chair to avoid that.

(3) Check from the side and adjust the chin rest until the examinee's eye level is in line with the eye mark.

(4) When the eye appears on LCD monitor, carry out alignment for correct measurement.

> NOTE Refer to '6.2 Alignment' for detail procedure.

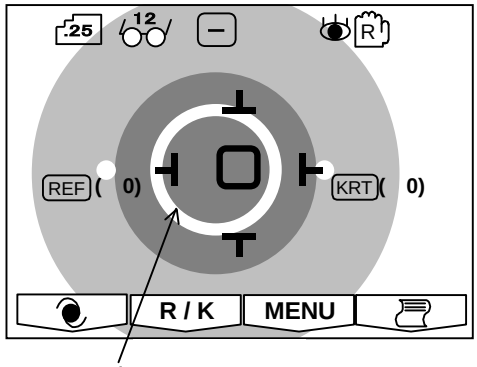
(5) Press the measurement start switch when the alignment mark reaches a center of the reticle mark, and take measurement.

> NOTE ACCUREF-K is equipped with high-speed measurement function.
> This function allows you to measure continuously if you keep pressing the measurement start switch during measurement.

6.2 Alignment

(1) Operate a joystick to bring a subject eye on the monitor. A kerato ring will appear.

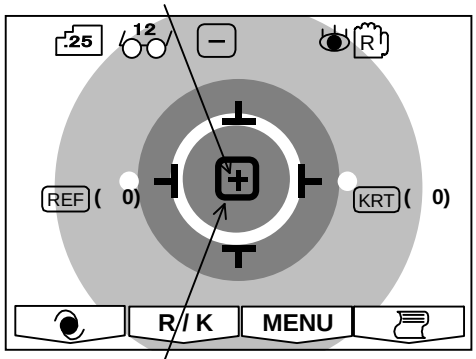
> **NOTE** If the eyelid is over the kerato ring, urge the examinee to open the eye bigger.



Kerato ring

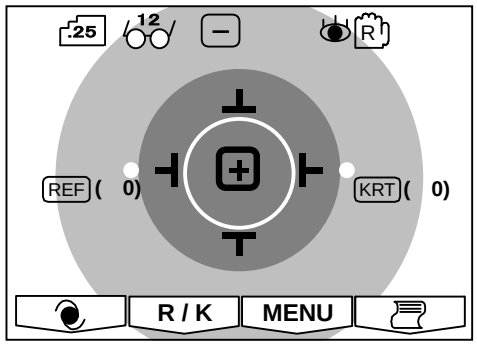
(2) Align a reticle mark to the center of the eye and focus on the subject eye. Alignment mark (+) will appear.

(3) Operate the joystick to bring the alignment mark (+) into the center of the reticle mark.



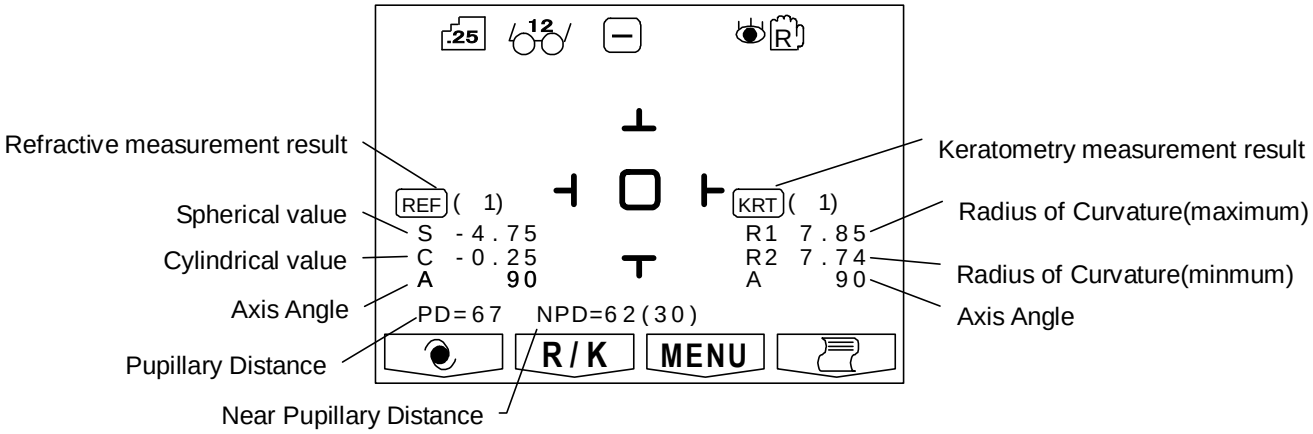
(4) Keeping the alignment mark (+) in the center of the reticle mark, focus the subject eye and press the measurement start switch.

(For auto measurement, measurement will automatically start once the focus on the eye is achieved.)



> **NOTE** When focus is achieved, the kerato ring will become thinnest.

6.3 Measurement Results



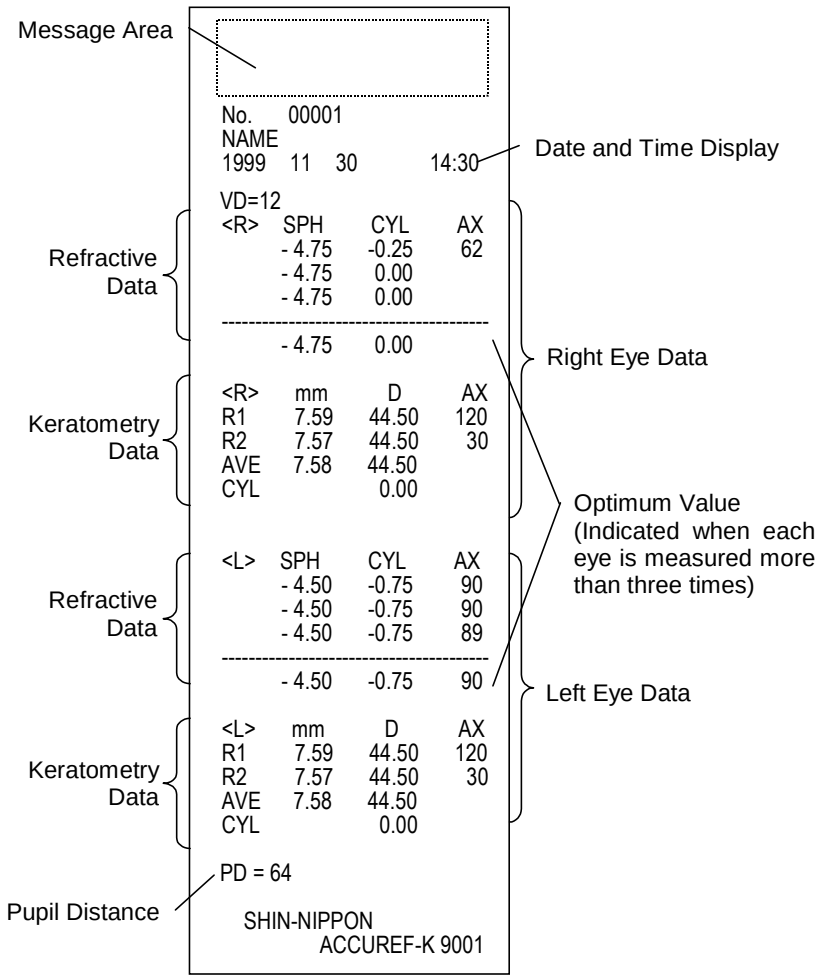
※ PD result is indicated after both right and left eyes are measured. The order of the eye to be measured is not important.
NPD is indicated when some value is set in 'W-D (cm)' of menu screen only.

6.4 Print Out

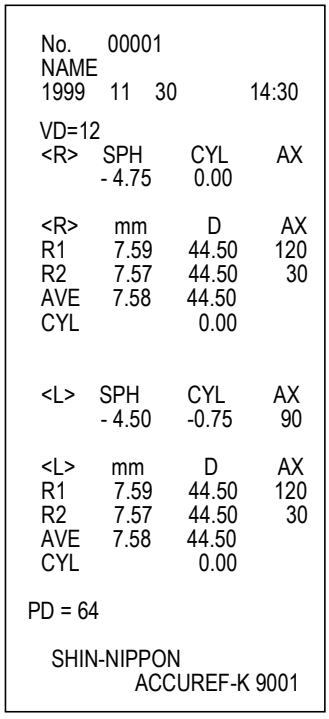
Normally you can print out the measurement result after the measurement, using PRINT switch.
For refractive measurement, a maximum of ten data for each eye can be saved and the most reliable value among them is indicated as an optimum value. However, it is printed out only when each eye is measured more than three times.
For keratometry measurement, an optimum value only is printed out.
Format of the printout, ALL, ECONO and OFF, can be set on the menu screen.

- ＊ ALL : in case of refractive measurement, prints out a maximum of ten data for each eye. For other measurements, respective optimum values only are printed out.
- ＊ ECONO: prints out only optimum values of all measurement data.
- ＊ OFF : prints out no data.

Sample Print Out
when PRINT FORM is set to ALL



Sample Print Out
when PRINT FORM is set to ECONO



※ Meesage Area

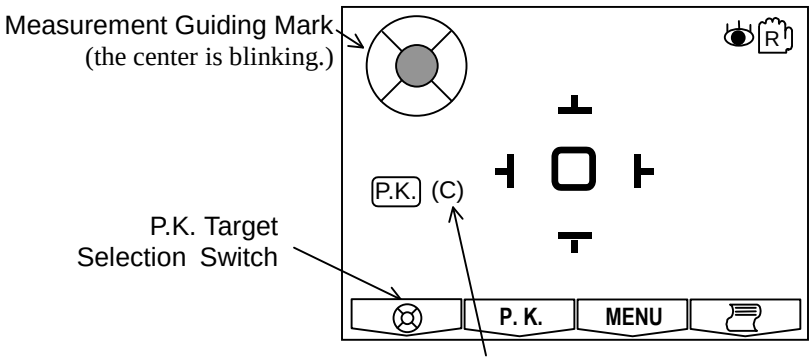
You can print out registered characters in the range of 22 character/line × 2 lines in the message area. For registering characters, refer to '6.7.2 Option Function: 1. Message Input Function'.

6.5 Kerato-Peripheral Measurement

ACCUREF-K has a function to measure not only a center but also peripheries of a cornea.

Operation

(1) Press a measurement mode selection switch to switch over to P.K. mode.
P.K. measurement screen will appear, and 'measurement guiding mark' (see NOTE below) which indicates the measurement position will appear on the top of the screen.



Measurement position :
Normally measurement is taken in the following order:
C→S→T→I→N.

C（Central）	: center
S（Superior）	: top
T（Temporal）	: temple side
I（Inferior）	: bottom
N（Nasal）	: nasal side

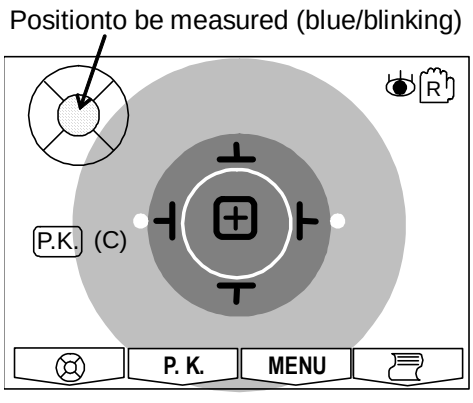
NOTE

Measurement Guiding Mark

A measurement guiding mark changes its color and state to signal the measurement position and the end of measurement. Each color and state means as follows.

No color:	where have not been measured yet.
Blue / Blinking:	where is going to be measured.
Yellow / On:	where measurement is complete.
Blue & Yellow /Blinking:	where is measured once but going to measure again.

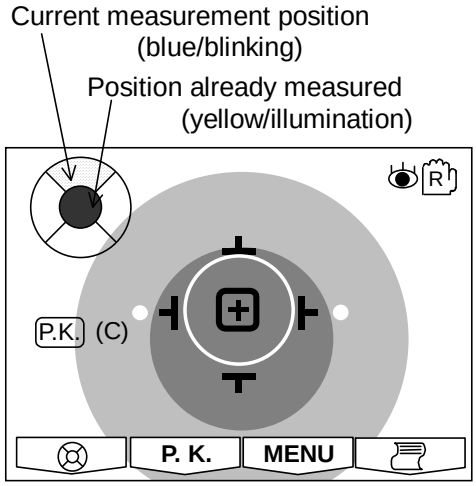
(2) Measure the center, following kerato measurement procedure.
When the measurement is complete, the center of the measurement guiding mark (blue/blinking) will change to yellow illumination. Then, the next measurement position (top) starts blinking.



NOTE

Always start to measure from the center. However, it is not necessary when the center is already measured in R/K mode or Kerato mode.

(3) Start to measure the corneal periphery.
Have the examinee look at the fixation target that is turned on. A measurement position of the measurement guiding mark turns blue and blinking at this time.
Carry out alignment and press the measurement switch. When the measurement is completed, the blue blinking indication will change to yellow illumination. Then, the next measurement position will start blinking.

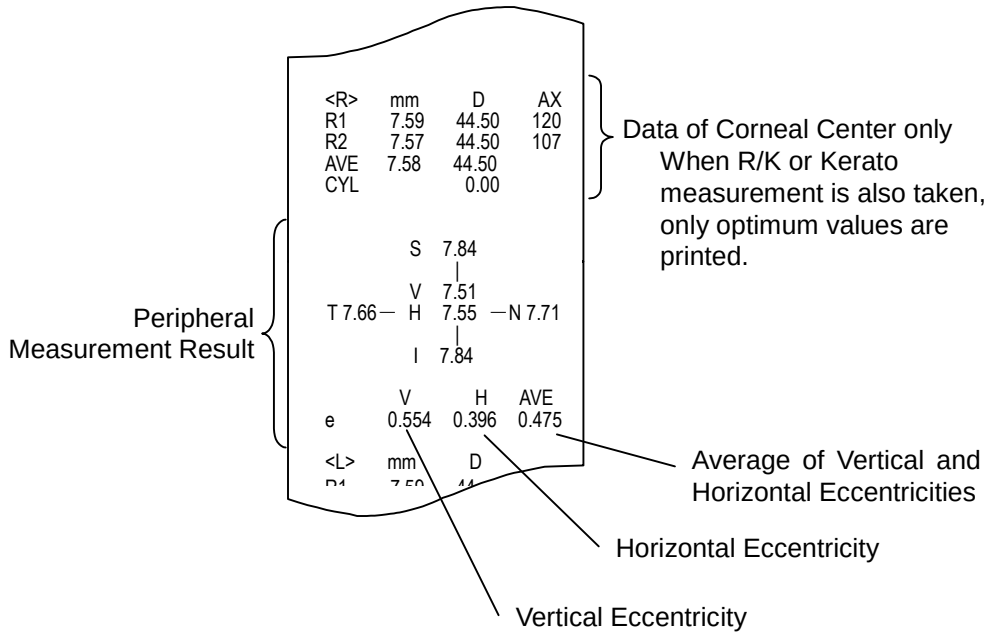


NOTE
For peripheral measurement, bring the kerato rings to the center of the reticle mark, not to the center of pupil.

(4) Complete the peripheral measurement for all four positions. When it is completed, all positions of the measurement guiding mark will turn yellow and illuminate.
Proceed to measure the other eye, following the procedure above.

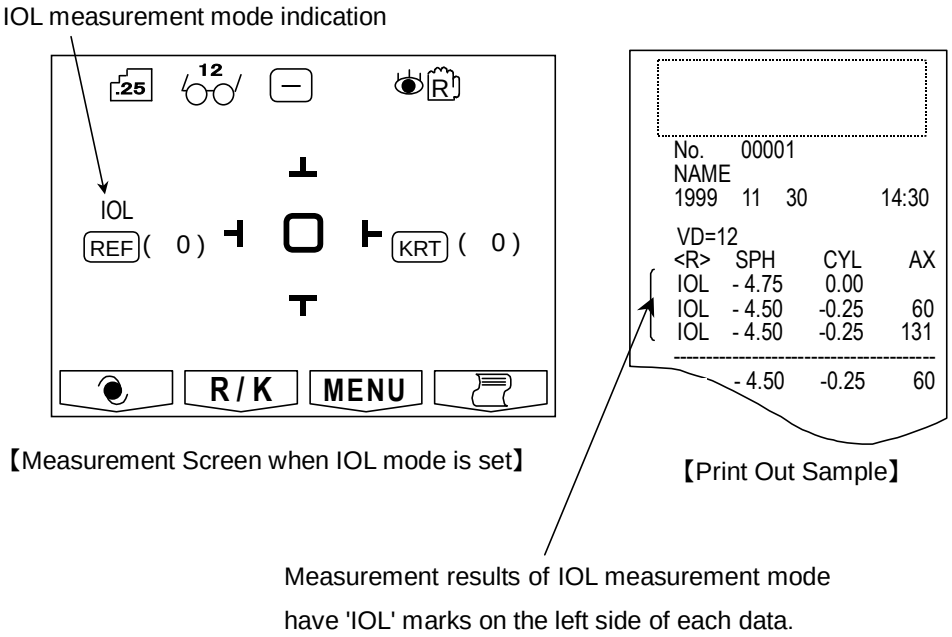
NOTE
- When you wish to measure some position again, use P.K. target selection switch to move the cursor to the position you wish to measure.
- When you can not take any data, or you do not need all data of the peripheral measurement, you can skip some position using P.K. target selection switch.
  In such a case, the result of the position measured only is displayed. The center, however, must be measured all the time.

Printout Sample of P.K. Measurement



6.6 IOL Measurement Function

ACCUREF-K has the function to measure the IOL (intraocular lens) implanted eye.
When measuring the IOL implanted eye, press IOL switch on the front panel of the body.
Then, icon for IOL mode is indicated on the left side of the LCD monitor.



IOL measurement mode will be cancelled:

① when IOL switch is pressed again.
② when the measurement mode is switched over to either K mode or P.K. mode.
③ when print switch is pressed.
④ when the eye to be measured is swtiched from right to left or vice versa.
⑤ when the power is turned off.

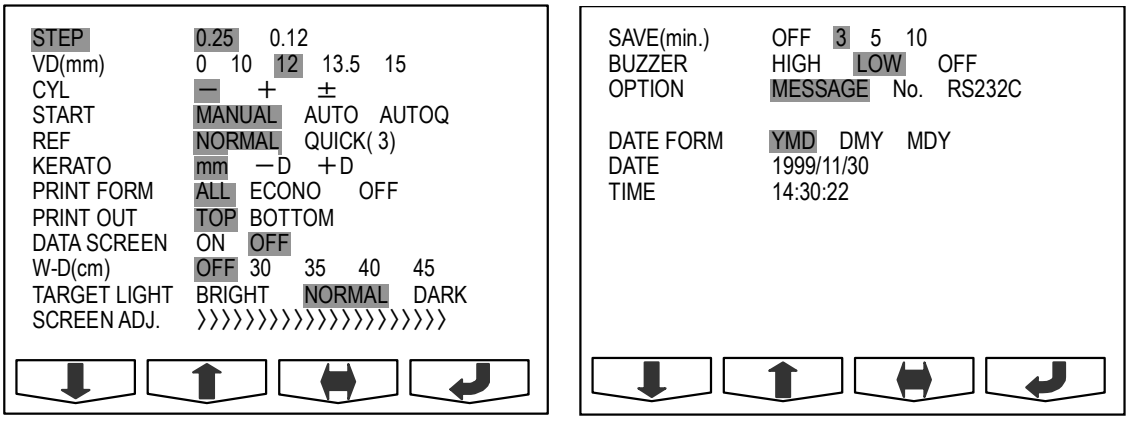
NOTE If IOL mode is not set when IOL implanted eye is measured, error message may appear and measurement may fail.

6.7 Menu Screen Setting

Standard measurement mode is preset to be ready to use. However, you can easily alter the setting if you wish.

To enter the menu screen, press a menu switch below the LCD monitor.

【Menu Screen】


STEP 0.25 0.12
VD(mm) 0 10 12 13.5 15
CYL − + ±
START MANUAL AUTO AUTOQ
REF NORMAL QUICK(3)
KERATO mm −D +D
PRINT FORM ALL ECONO OFF
PRINT OUT TOP BOTTOM
DATA SCREEN ON OFF
W-D(cm) OFF 30 35 40 45
TARGET LIGHT BRIGHT NORMAL DARK
SCREEN ADJ. 〉〉〉〉〉〉〉〉〉〉〉〉〉〉〉〉〉〉〉〉
SAVE(min.) OFF 3 5 10
BUZZER HIGH LOW OFF
OPTION MESSAGE No. RS232C
DATE FORM YMD DMY MDY
DATE 1999/11/30
TIME 14:30:22

the First Screen　　the Second Screen

Change of Switch Function

Each switch will change its function when you enter the menu screen.
Follow the icons indicated on the bottom of the screen, which corresponds to each switch (see below).

◆ Moves the cursor downward on each setting menu.

◆ Moves the cursor upward on each setting menu.

◆ Selects the item in each setting menu. The cursor moves to the right.

◆ Completes the setting and returns to the measurement screen.

6.7.1 Each Item Description

【The First Screen】

■ STEP　　Selects the increment for refractive measurement.

■ VD(mm)　　Selects corneal vertex distance.

■ CYL　　Selects the sign for astigmatism.

■ START　　Selects how to start measurement. Refer to '6.8 Auto Start Function' for detail.

MANUAL: Begins measurement every time a measurement switch is pressed.

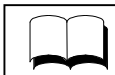
AUTO : Measurement starts automatically when the measurement conditions are determined appropriate. Each eye is measured continuously three times for KERATO and REF measurements. The result is printed out automatically when the measurement finishes.
(Fogging is activated for every REF measurement.)

AUTOQ : Measurement starts automatically when the measurement conditions are determined appropriate.
Each eye is measured continuously once for KERATO and three times for REF measurements.
The result is printed out automatically when the measurement finishes.
(Fogging is activated for the first REF measurement only.)

■ REF　　Selects refractive measurement method.

NORMAL: takes one measurement when the measurement start switch is pressed one time.

QUICK : takes measurements continuously for the number of times preset when the measurement start switch is pressed one time.
A maximum of ten measurements can be taken.



REF setting is invalid when START is set to AUTO.

■ KERATO　　Selects the unit for radius corneal curvature.

mm : Radius of corneal curvature
－D : Corneal refraction（－sign）
＋D : Corneal refraction（＋sign）

■ PRINT FORM　　Selects printout format. Refer to '6.4 Print Out' for detail.

ALL : prints all data out.
(maximum ten data each in case of refractive measurement.)
ECONO : prints only optimal values.
OFF : no print outs.

■ PRINT OUT　　Selects direction of data printed out.

■ DATA SCREEN　　Displays measurement results saved in the memory on the screen. Refer to '6.9 Data Screen Function' for detail.

ON : displays all measurement results on the screen.
OFF : does not display the result on the screen.

■ W-D (cm)　　Sets near work distance. When measurement is taken with this item set, near pupil distance is automatically computed to indicate it on the screen and the printout.

NOTE This function becomes valid when refractive measurement is taken.

■ TARGET LIGHT　　Sets brightness of the target.

BRIGHT : brighten the target.
NORMAL: normal setting.
DARK : darken the target.

■ SCREEN ADJ.　　Adjust or alter brightness of LCD monitor.

NOTE

Switch Functions will change in this item as below.

- [+] (K･R>R>K> P.K. Switch) : makes the monitor brighter
- [−] (IOL Switch) : makes the monitor darker

When you finish adjusting or altering, move the cursor to any other items except for "SCREEN ADJ.", using [↓] or [↑] switch.

【The Second Screen】

■ SAVE (min.)　　Selects switchover time (in minute) to activate power saving function.

■ BUZZER　　Sets volume of buzzer at measurement.

HIGH : turns volume up.
LOW : turns volume down.
OFF : no buzzer

■ OPTION　　Selects and sets optional functions. Refer to '6.7.2 Optional Function' for detail.

MESSAGE : shifts to the screen for registering message.
No. : shifts to the screen for setting examinee's number.
RS232C : shifts to the screen to set RS232C transmission parameters.

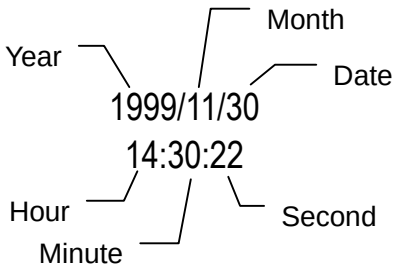
■ DATE FORM　　Selects display form of date.

YMD: year / month / date
DMY: date / month / year
MDY: month / date / year

■ DATE　　Sets and corrects date.

■ TIME　　Sets and corrects time.

If you wish to correct date or time, move the cursor to the number you wish to change.



NOTE

Switch Functions will change in this item as below.

- [+] : Increases the number.
- [−] : Decreases the number.

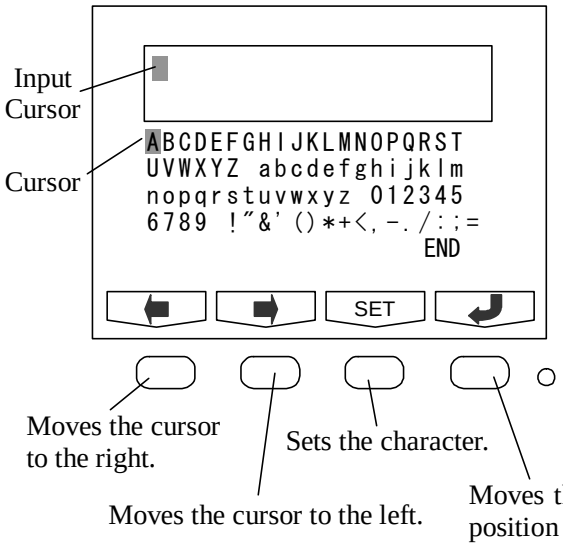
When you complete all settings or changes, press [↓] or [↑] switch to move the cursor to any items other than TIME. Then, press [↵] switch to return the measurement mode.

6.7.2 Optional Functions

When you select the function you wish to set from 'OPTION' of menu screen, you can enter each option screen.

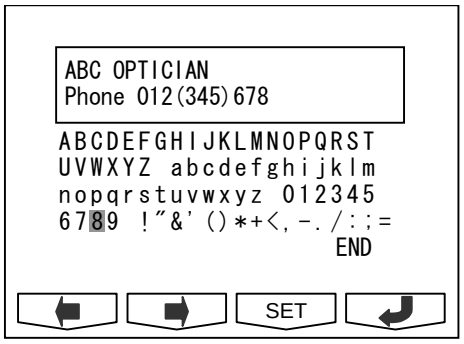
【Each Option Screen and Description】

I. Message Input Function



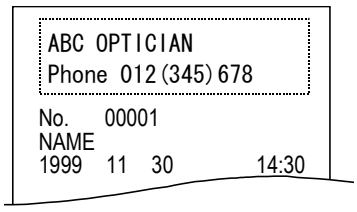
With this function, you can print out registered messages in the area of 22 characters / line × 2 lines.

When you select this menu, the screen on the left will appear, and function of each switch will change as shown on the left.



(1) With ◀ or ▶ switch, select the character you wish to input and confirm with SET switch.
Then, the input cursor moves to the next input area to be ready for the next input.

NOTE When you need to change the character already inputted, press ▶ switch to move the input cursor to the character you wish to input. Then, you can write over.



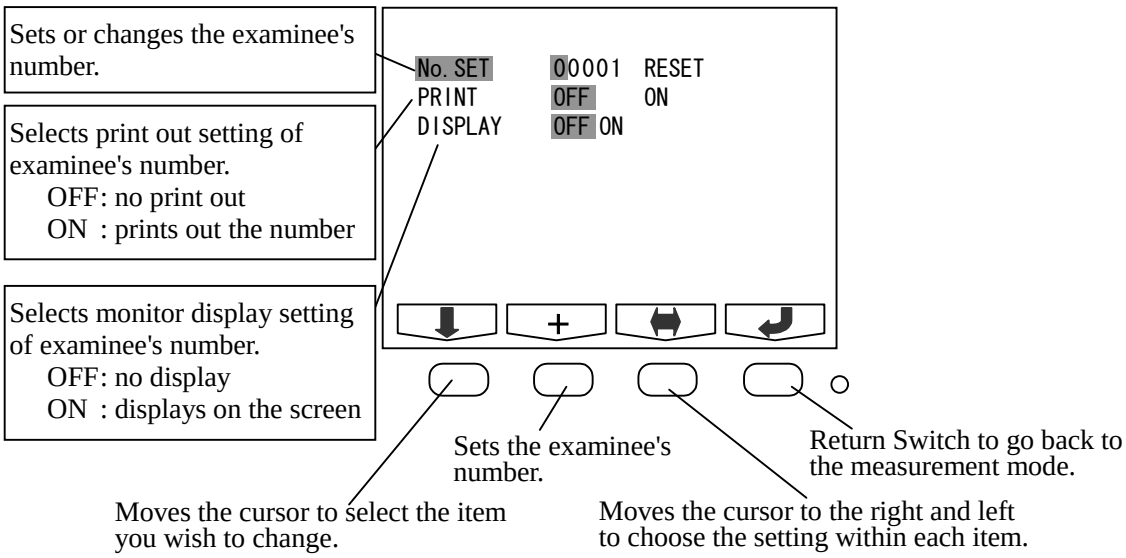
〔Print Out Sample〕

(2) When the setting is completed, move the input cursor to 'END' and press SET switch to go back to the menu screen.

II. No. Function

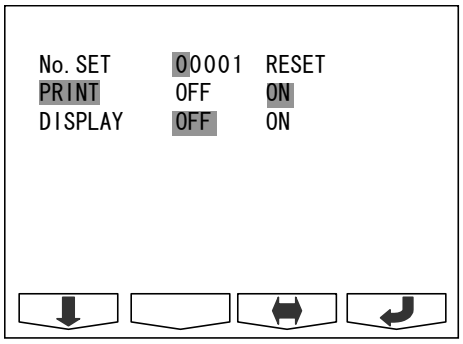
You can set or change the examinee's number, and select whether the number is displayed on the screen and whether the number is printed out.

When you select this menu, the screen below will appear and function of each switch will change as follows.


Sets or changes the examinee's number.
Selects print out setting of examinee's number.
OFF: no print out
ON : prints out the number
Selects monitor display setting of examinee's number.
OFF: no display
ON : displays on the screen
No. SET 00001 RESET
PRINT OFF ON
DISPLAY OFF ON
Sets the examinee's number.
Return Switch to go back to the measurement mode.
Moves the cursor to select the item you wish to change.
Moves the cursor to the right and left to choose the setting within each item.

NOTE

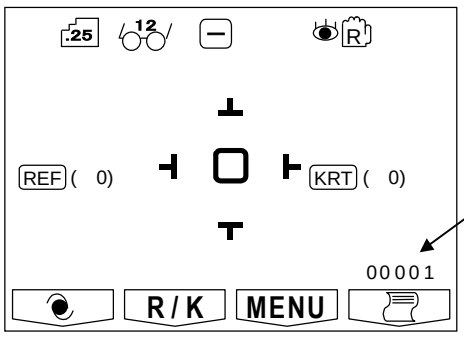
Resetting Examinee's Number
When you wish to reset the examinee's number, move the cursor to RESET of No.SET and press the measurement start switch.



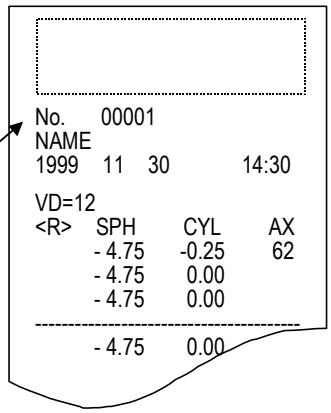
【Screen when DISPLAY is set to ON】

(1) Move the cursor to the item you wish to set/change with ↓ switch and execute with ↔ switch.

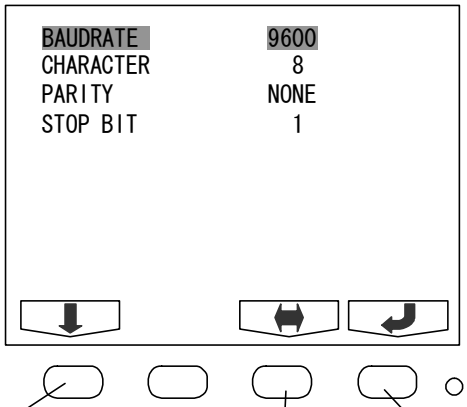
(2) When you complete the setting, press ↵ switch to go back to the menu screen.



【Print out when PRINT is set to ON】



III. RS232C Setting Function



With this function, you can send the measurement data to an external computer through an interface. The data is sent using ASCII CODE.

When you select this menu, the screen on the left will appear and function of each switch will change as shown.

Moves the cursor downward to select the item you wish to change.

Return switch to go back to the measurement mode.

Changes the setting of the item selected.
The display changes every time the switch is pressed.
Press the return switch at any given setting.

【Each Item Description】

1. BAUDRATE : Selects a kind of transmission rate for a serial interface.

BAUDRATE to be selected	Standard Setting
38400bps	
19200bps	
9600bps	○
4800bps	
2400bps	

2. CHARACTER : Selects a kind of data bit for a serial interface

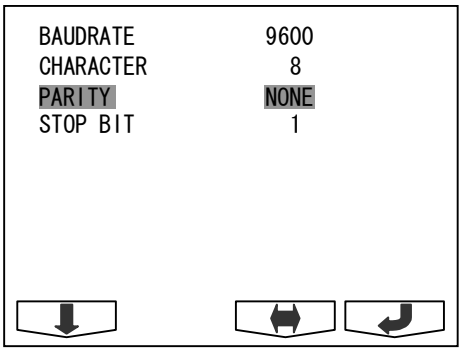
CHARACTER to be selected	Standard Setting
8	○
7	

3. PARITY : Selects a kind of data check transmitted from a serial interface.

PARITY to be selected	Standard Setting
EVEN	
ODD	
NONE	○

4. STOP BIT : Selects a kind of code to terminate data output from a serial interface.

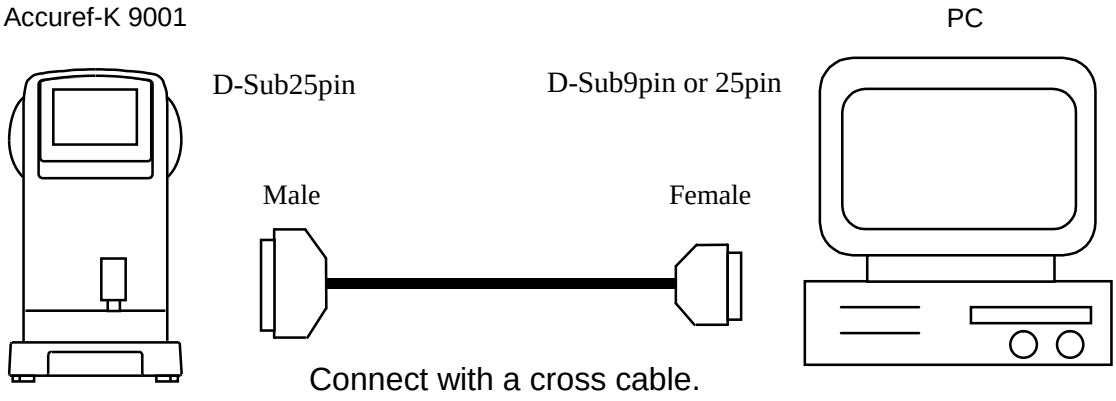
STOP BIT to be selected	Standard Setting
2	
1	○



(1) Move the cursor to the item you wish to set/change with ⬇ switch and execute with ⇔ switch.

(2) When the setting is completed, press ↵ switch to go back to the menu screen.

【Connecting method】



■ Connections

D-Sub25pin			D-Sub9pin			D-Sub25pin	
TXD	2	———	2	RXD		3	RXD
RXD	3	———	3	TXD		2	TXD
DSR	6	———	4	DTR		20	DTR
SG (GND)	7	———	5	SG (GND)		7	SG (GND)
DTR	20	———	6	DSR		6	DSR

NOTE Use a shield type of cable for the connection cable in order to protect the output data from noise.

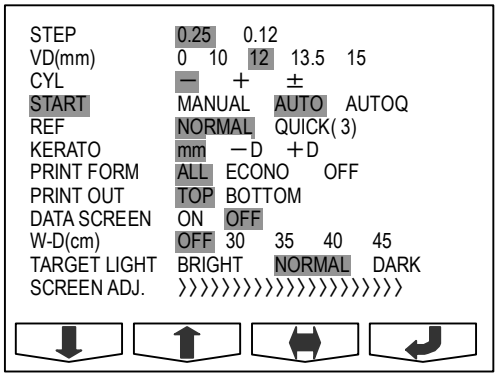
※ If you have any inquiries about changes in transmission parameters and/or detail connections, please direct them to the relevant agent or distributor.

In case of connecting the instrument to other devices using RS232C connector, it should be connected with devices complying with IEC60601-1 and IEC60950.

6.8 Auto Start Function

ACCUREF-K has Auto Start function.
This function starts measuring automatically when alignment meets the measurement requirement, and also prints out automatically when the measurement of both eyes completes.

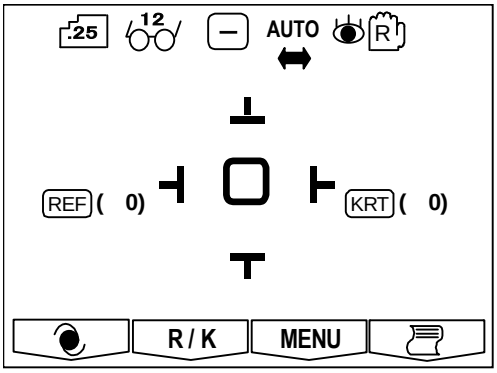
> **NOTE** When Auto Start function is enabled, measurement is taken according to the Setting of START regardless of the setting of REF item in the Menu screen.


STEP 0.25 0.12
VD(mm) 0 10 12 13.5 15
CYL − + ±
START MANUAL AUTO AUTOQ
REF NORMAL QUICK(3)
KERATO mm −D +D
PRINT FORM ALL ECONO OFF
PRINT OUT TOP BOTTOM
DATA SCREEN ON OFF
W-D(cm) OFF 30 35 40 45
TARGET LIGHT BRIGHT NORMAL DARK
SCREEN ADJ. 〉〉〉〉〉〉〉〉〉〉〉〉〉〉〉〉〉〉〉〉

(1) When you wish to measure with auto start function on, set 'START' in the menu screen to 'AUTO' or 'AUTOQ'.

(2) Then, press switch to go back to the measurement screen.

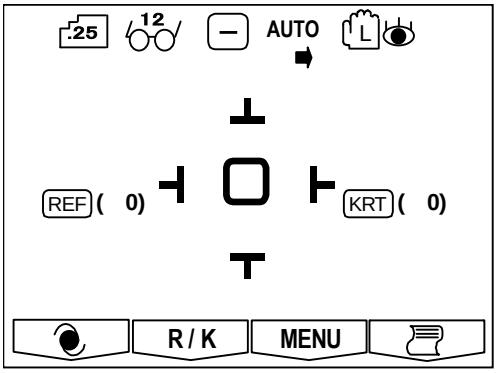
(3) Auto Start mode is activated when 'AUTO' and arrows below 'AUTO' appear on the top of the screen (see on the left).
You can measure either left or right eye first.



(4) Carry out alignment. Measurement will automatically start when alignment is achieved.

> **NOTE** For alignment, refer to '6.2 Alignment'.

(5) When the measurement of one eye finishes, an arrow on either left or right side you have measured will disappear.



> **NOTE** Arrows and signal the operator completion of measurement by disappearing.

(6) Take a measurement for another eye following the steps above.

(7) When measurement of both eyes are over, the arrow will disappear and the result will be automatically printed out.

> **NOTE** The data printed out depends on the setting of print out format.
> When the data screen function is set on, representative data is displayed on the screen after both eyes are measured.

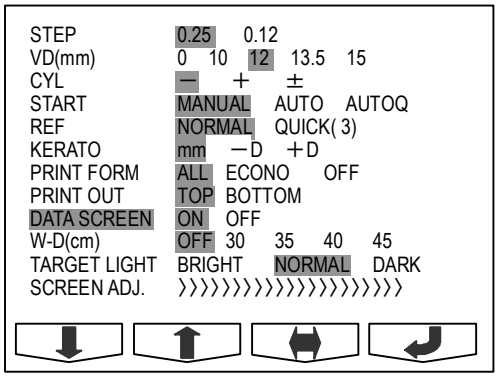
(8) If you still wish to measure with auto start function, realignment is necessary.

> **NOTE** When you wish to cancel auto start function, change the setting of 'START' back to 'MANUAL' in the menu screen.

6.9 Data Screen Function

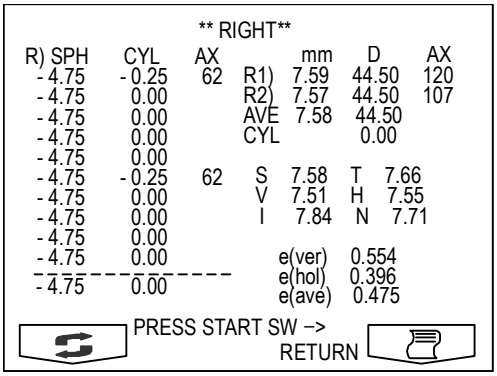
Data screen function allows you to check measurement results saved in the memory on the screen.

When displaying measurement data on the screen


STEP 0.25 0.12
VD(mm) 0 10 12 13.5 15
CYL − + ±
START MANUAL AUTO AUTOQ
REF NORMAL QUICK(3)
KERATO mm −D +D
PRINT FORM ALL ECONO OFF
PRINT OUT TOP BOTTOM
DATA SCREEN ON OFF
W-D(cm) OFF 30 35 40 45
TARGET LIGHT BRIGHT NORMAL DARK
SCREEN ADJ. 〉〉〉〉〉〉〉〉〉〉〉〉〉〉〉〉〉〉〉〉

(1) Select 'ON' in 'DATA SCREEN' field of the menu screen.

> **NOTE** When 'DATA SCREEN' is set ON, the setting of 'PRINT FORM' (see 6.7.1 Each Item Description) is invalid.

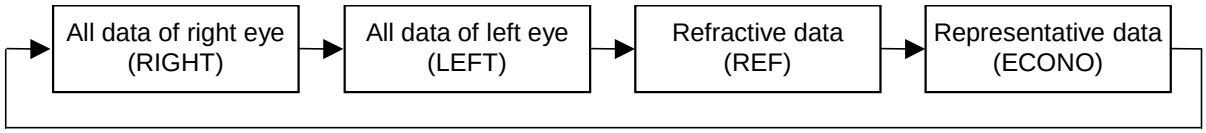


(2) After the measurement, press switch and the data screen on the left will appear.

> **NOTE** You will see 'I' mark at the left side of each refractive data as shown below when you measure with IOL measurement mode.
>
> Example:

	SPH	CYL	AX
I	- 4.75	- 0.25	62

(3) Displaying the data on the screen, press switch to change over the display as below.



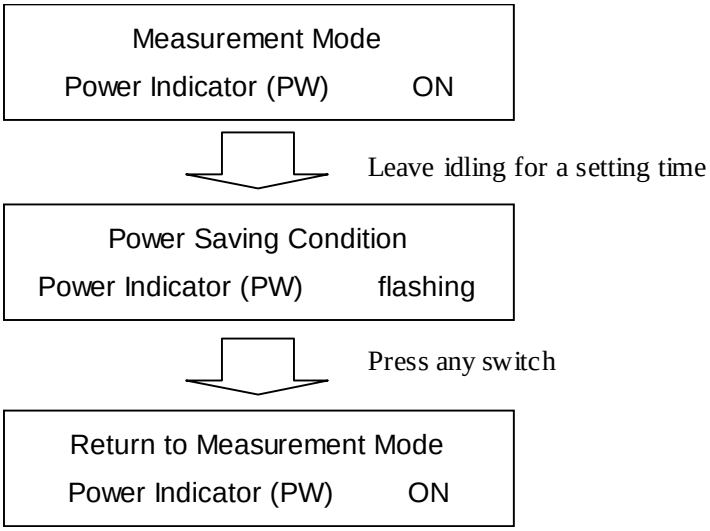
(4) When you wish to print out the data, press switch.

(5) Press the measurement start switch to go back to the measurement screen.

6.10 Power Saving Function

Power saving function will start operating when switch operation is suspended with the power on.
(The switchover time (in minute) can be selected at 'SAVE' on the mode selection screen.)

To return to the measurement mode, press any switch (any switch on the front panel or the measurement start switch).



6.11 Output Terminal

Video Terminal

This terminal outputs an NTSC video signal.
If you connect an external monitor such as a portable TV or similar unit to ACCUREF-K with pin plug (video) cable, you can observe and check the same image that appears on the internal monitor screen of ACCUREF-K simultaneously.

7. Tips for Effective Measurement

(1) Do not allow external light to directly penetrate the room.

(2) Fluctuation of values during measurement may occur if the examinee looks something other than the target. Urge the examinee to concentrate on the target set in front.

(3) Talk to the examinee in a relaxed and friendly manner, so as to allay any fear or doubt they may have.

(4) Inappropriate height of a chin rest or a chair will cause the examinee fatigue. Adjust the (optional) instrumental table to establish the most comfortable and convenient position for the examinee.

(5) When the eyelash or eyelid interfere measurement, error will occur in measurement. Urge the examinee to keep his/her eye wide open.

(6) Tear residue or eye mucus, etc. trapped on the corneal surface may cause measurement errors. Check the surface with LCD monitor, and if you see something moving when the examinee blinks, remove it before measurement.

(7) When the pupil of the eye to be examined is smaller than the minimum pupil diameter measurable, correct measurement will be impossible. When the pupil is too small to take correct measurement, make the surroundings (room) or the target darker to allow the pupil to dilate as much as possible.

(8) If the examinee's head moves during measurement, AXIS value will be adversely affected. Ask him/her to maintain correct posture.

8. Error Messages

ACCUREF-K automatically evaluates measurement condition or result and indicates error messages if it is invalid. Error messages also appear when abnormality is detected in its operational system.
When any error message appears, always check the system with a supplied model eye. If it appears when no abnormality in system is detected, check the measured eye for eye disease or problem.

Message	Cause/Explanation	Corrective Action
RETRY	Failed to capture eye image because the examinee blinks or moves during measurement or the examined eye has an eye disease.	Realign precisely and take measurement again. Consult your dealer immediately if the message reappear. **Do not try to repair by yourself.**
SPH OVER	Exceeded spherical measurement range (–25D to +25D). (when VD = 0)	
CYL OVER	Exceeded cylindrical measurement range (0 to ±10D) .	
Motor fault.	Detected abnormality in motor control system.	Cut the power and turn it back on. Consult your dealer immediately if the message reappear. **Do not try to repair by yourself.**
EEPROM fault.	Failed to initialize.	
Printer head up lever.	Printer head is up.	Close the printer head.
Printer head heat over.	Printer head is overheating.	Cut the power and stop using until the head cools off. Consult your dealer immediately if the message reappear. **Do not try to repair by yourself.**
Printer cutter fault.	A paper jam occurred at a printer cutter or the printer cutter did not move for some reason.	**Always cut the power**, and check on the paper jam. If the message reappears without the paper jam, consult your dealer immediately. **Do not try to repair by yourself.**
Paper empty.	No printer paper.	Set the printer paper. See '11.1 Reloading Printer Paper.'

9. Troubleshooting

If there are any malfunction found, refer to the table below to take appropriate measures.

CAUTION	Never disassemble, modify or repair the instrument. Personal injury may result from electric shock.

Symptom	Causes and Measures
The monitor and power indicator are not turned on.	• The power cord may not be properly connected. Make sure to connect it securely. • Fuse may be blown. If so, replace it to the new one.
Fuse is blown when the power switch is turned on.	• Contact your local distributor immediately.
The monitor display suddenly disappears.	• The saving function may be activated. Press any switch to deactivate the saving function.
The main body can not be moved in a horizontal direction.	• Anti-sliding lock may be locked. Unscrew the lock under the base.
The moving parts such as a joystick are not moving appropriately.	• Do not move the part forcibly. Contact your local distributor or service person.
The apparatus does not print out.	• Check the papers being set. Reload them if the papers are out. • PRINT FORM in the MENU screen may be set for OFF. Change the setting.
The printer papers come out but no printing.	• The printer paper may be set in a wrong direction. Set the paper properly.
The date setting becomes inaccurate.	• The battery inside the apparatus may be dead. Keep the power on for 24 hours to recharge it.

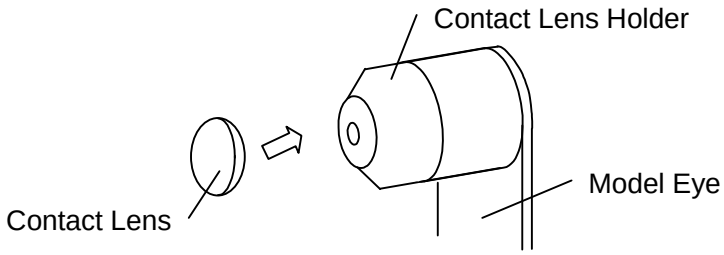
Contact your local distributor immediately if the situation does not improve even when the measures mentioned above are taken.

10. Contact Lens: Base Curve Measurement

You can measure a base curve of a hard contact lens with ACCUREF-K.
To do so, attach a contact lens onto a contact lens holder of the model eye as following.

(1) Put a small amount of water on a concave side of the contact lens holder.

(2) Place the contact lens so that its convex side faces the holder.

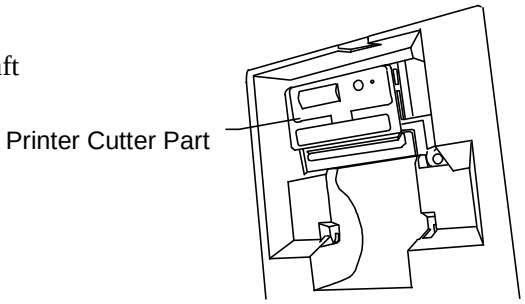


(3) Confirm the contact lens is firmly adhered to the holder and does not slip down, set the model eye unit to measure.

11. Storage and Maintenance

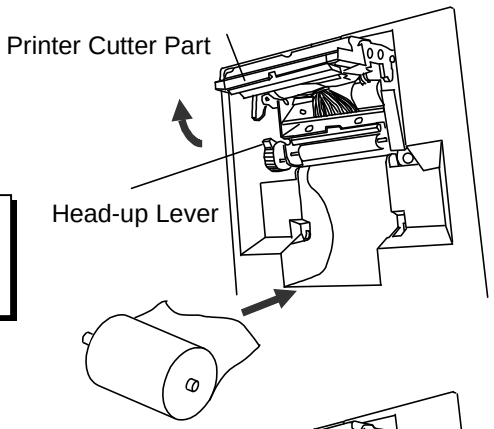
11.1 Reloading Printer Paper

1) Remove a printer cover and take a printer paper shaft out.



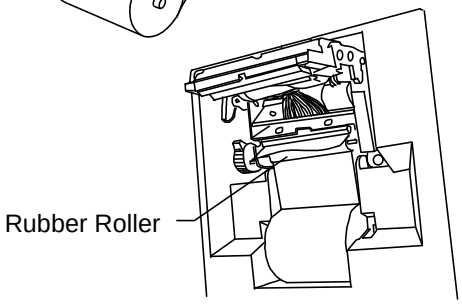
2) Lift a printer cutter part and pull up a head-up lever.

3) Set a roll of printer paper, paying attention to direction of the paper rolled up.



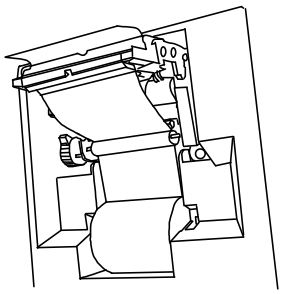
> **NOTE** The loose end of the paper should be drawn forward in a counterclockwise direction.

4) Insert the loose end of the paper behind a rubber roller. Press print switch more than one second to feed the paper out.

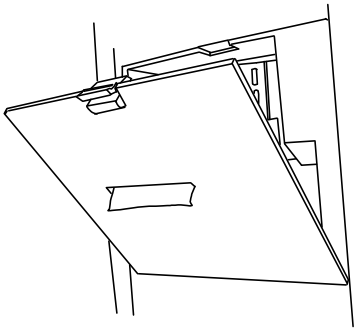


> **NOTE** Never pull the paper out.
> Pulling the paper may cause the paper output incorrectly or jammed.

5) Draw the paper through the printer cutter slot and lower the head-up lever and the printer cutter back to the original positions.



6) Draw the paper through a cutter slot of a printer cover and reattach the printer cover to complete the procedure.

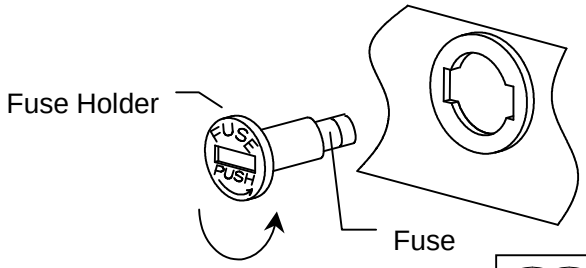


> Always use the specified printer paper only. The paper other than the specified one may cause a paper jam or fade in printing.

11.2 Fuse Replacement

CAUTION	When replacing a fuse, unplug the power cord from the unit before removing the fuse holder. You may be in danger of electric shock if you remove the fuse holder without unplugging the power cord.

When a fuse is blown, remove a fuse holder at the side of a main unit for replacement.
Pushing the fuse holder, rotate it in the direction of the arrow below and you can remove it.



Rotate the holder counterclockwise.

NOTE Always use the specified fuse (T2A 250V).

11.3 Storage

(1) Points to be checked for long-term storage

- Turn the power switch OFF.
- Remove the power cord from the outlet.
- Lower the optical unit to the bottom (original position).
- Secure the body with the anti-sliding screw lock.
- Put a dustproof cover on the optical unit.

(2) Notes on storage environment

Avoid storage under the following conditions.

- Where dust accumulates.
- Where water may get on the unit.
- Where temperature and humidity are high.
- Where sunlight directly contacts.
- Unstable and/or high place.

Always follow the environment conditions below for storage.

Environmental Conditions	
Temperature	Relative Humidity
－10℃ ~ ＋60℃	below 70％

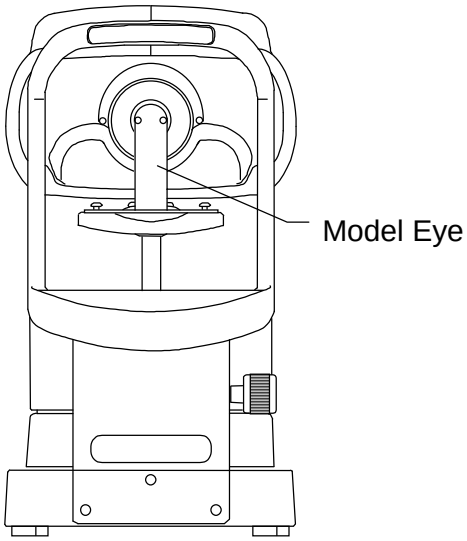
Always check above whenever you store or do not use ACCUREF-K for a long time.
When you reuse the instrument after long-term storage, operate according to instruction in ' 5. Preparation.'

11.4 Confirmation of Measurement Accuracy

It is extremely important to check operation and accuracy of the instrument using a supplied model eye.
We recommend you to check accuracy periodically.
When the measurement result of the model eye falls anywhere within the tolerance listed below, measurement should be considered reliable and accurate. When the result exceeds the tolerance, contact your dealer immediately.

Model Eye Data		
SPH	CYL	R
Indicated value ±0.25	0 ±0.25	Indicated value ±0.03

※Precise value of the supplied model eye is indicated on the model eye stand (VD =12).



NOTE **Note for setting of model eye**

- Remove a contact lens holder cap and set a model eye, checking it is not inclined in any directions.
  When the model eye is inclined, CYL value can not be correctly measured.
- Set the model eye at the position where an alignment mark is located in the center of a reticle mark.
- When conditions above have been satisfied, proceed to measurement.

11.5 Periodical Inspection and Maintenance

To prevent malfunction and accidents and maintain the performance and reliability of the product, it is recommended to request your distributor for the periodical inspection and maintenance once a year.
The periodical inspection and maintenance include inspection of the function and performance of the product, and cleaning, adjustment and replacement of consumable parts if necessary.

12. Specification

Refractive Measurement Range	Sphere (S)	-25～+25D	(step: 0.12/0.25D)
	Cylinder (C)	0～±10D	(step: 0.12/0.25D)
	Axis (A)	0～180º	(step: 1°)
Measurement Accuracy	Sphere	between －10～＋10D: ±0.25D beyond ±10 : ±0.5D	
	Cylinder	±0.25D	
Keratometry Measurement Range	Radius of Corneal Curvature	5.0～10.0mm	(step: 0.01mm)
	Corneal Refraction	33.75～67.5D	(step: 0.12/0.25D) (a refractive index of cornea: n = 1.3375)
	Cylinder	0～±9D	
	Axis	0～180°	(step: 1°)
Vertex Distance	0, 10, 12, 13.5, 15mm		
Minimum Pupil Diameter	φ 2.3 mm		
PD Measurement	Measurement range	85mm	(step: 1mm)
Measurement Time	Refractive measurement Keratometry measurement	approx. 0.07 sec. approx. 0.07 sec.	
Printer	Thermal line printer with automatic cutter (paper width 57mm)		
Internal Monitor	5.6 inch LCD monitor (color)		
Shifting Range for Sliding Body	back/forth ±17mm	right/left ±43mm	up/down 17 mm
Vertical Adj. Range for Chin Rest	±30mm		
Dimensions	240 mm (W)×422 mm (D)×438 mm (H)		
Weight	approx. 15kg		
Data Output	RS232C interface Video Terminal		
Power Source	100～240V 50／60Hz		
Consumption	80VA		
Power Saving Function	OFF, 3, 5, 10min.（switchable）		

Production Year

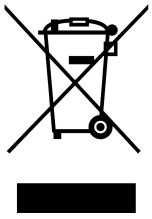
The second digit of serial number represents a production year of each instrument. The serial number is indicated on the nameplate that is on the side of body. See below.

5 7 A H 0 1 0 3

This number is the last digit of the production year.
In this example, the production year is 2007.

Exclusive Distributor

AJINOMOTO®
AJINOMOTO TRADING, INC.
SHIN-NIPPON Medical & Ophthalmic Instruments Dept.
EAST WING 7F, TFT BUILDING, 3-1-22
ARIAKE, KOTO-KU, TOKYO 135-8071, JAPAN
TEL: 813-3528-4416 FAX: 813-3528-4426
http://www.shin-nippon.jp http://www.ajitrade.com



- Please do not dispose this product as unsorted municipal waste.
- Please inquire the distributor about the return and the collection system.

RyuSyo Industrial Co., Ltd.
Kagawa Factory
958 IKEUCHI, KOUNAN-CHO,
TAKAMATSU, KAGAWA 761-1494, JAPAN

CE 0197

EC REP RyuSyo Industrial Co.,（Ireland）LTD.
Donore Road, Drogheda, County Louth, Ireland
TEL: +353-41-9839700 FAX: +353-41-9839702

RB-400-B02Q
Revision date: 2008.1.18